Fig.1A.

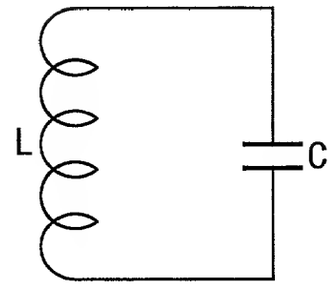


Fig.1B.

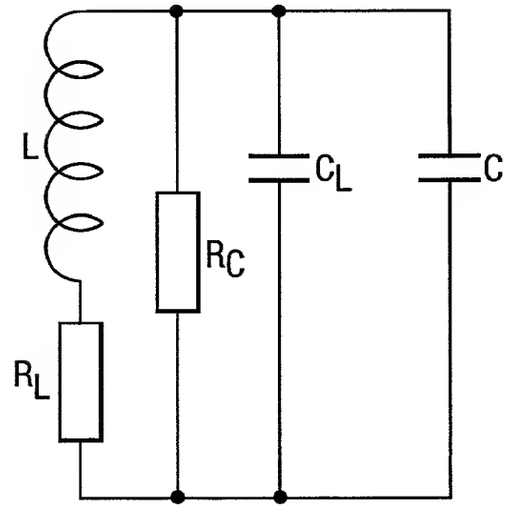
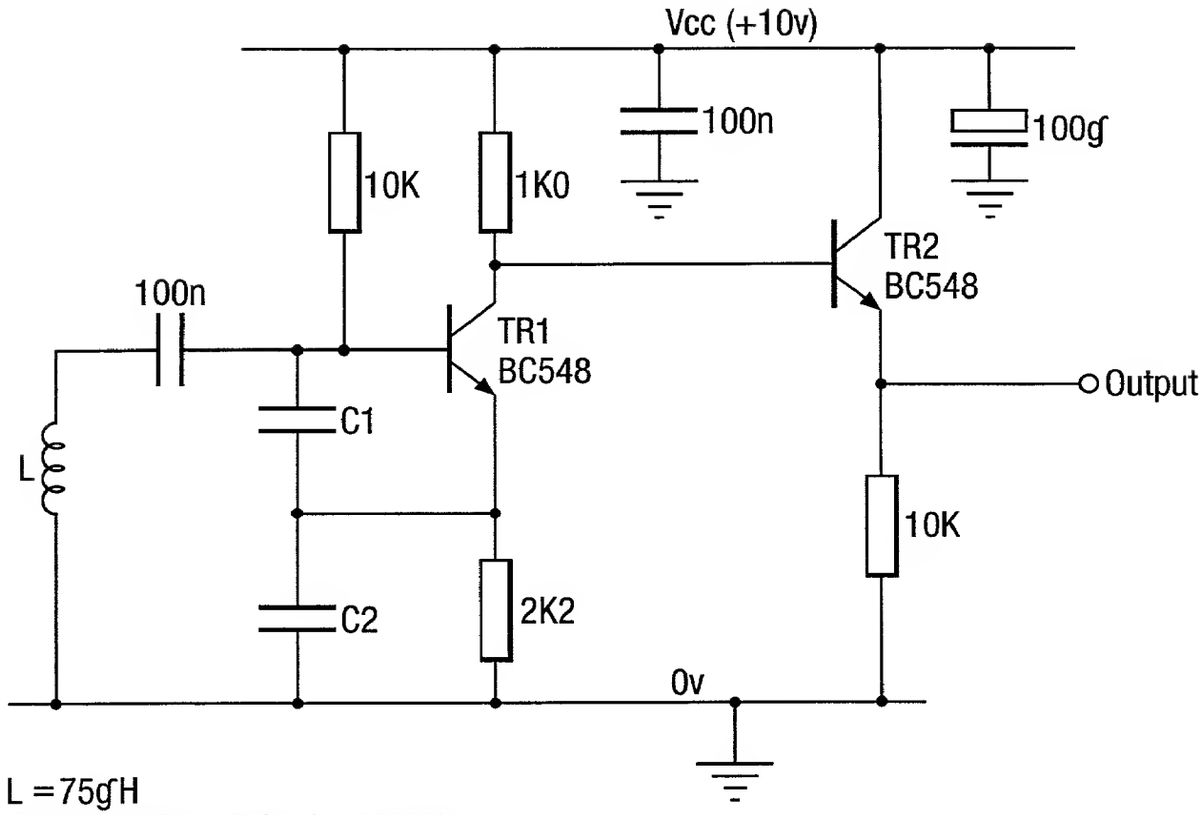


Fig.2.



L = 75µH
C1=1n5, c2=4n7 for f = 400kHz
C1=470p, C2=1n5 for f = 870kHz

Fig.3.

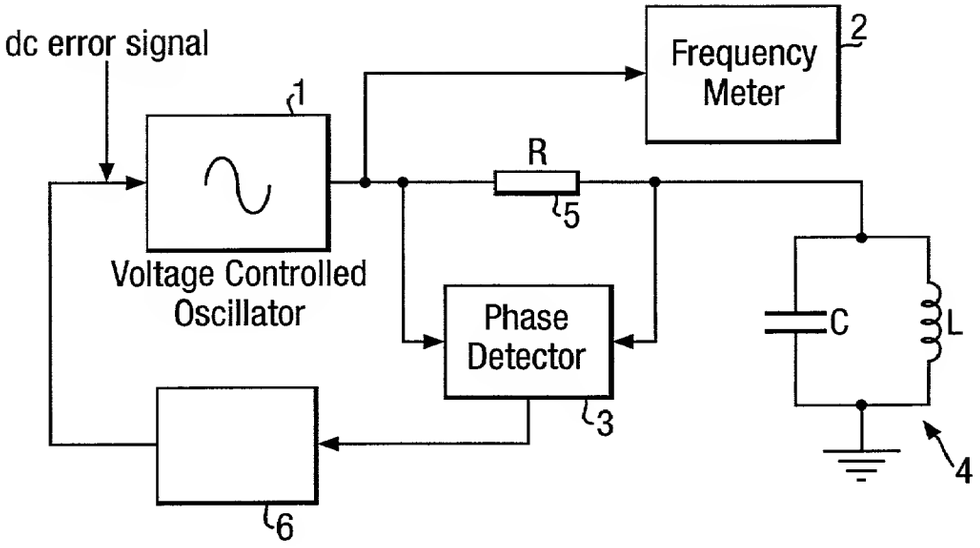
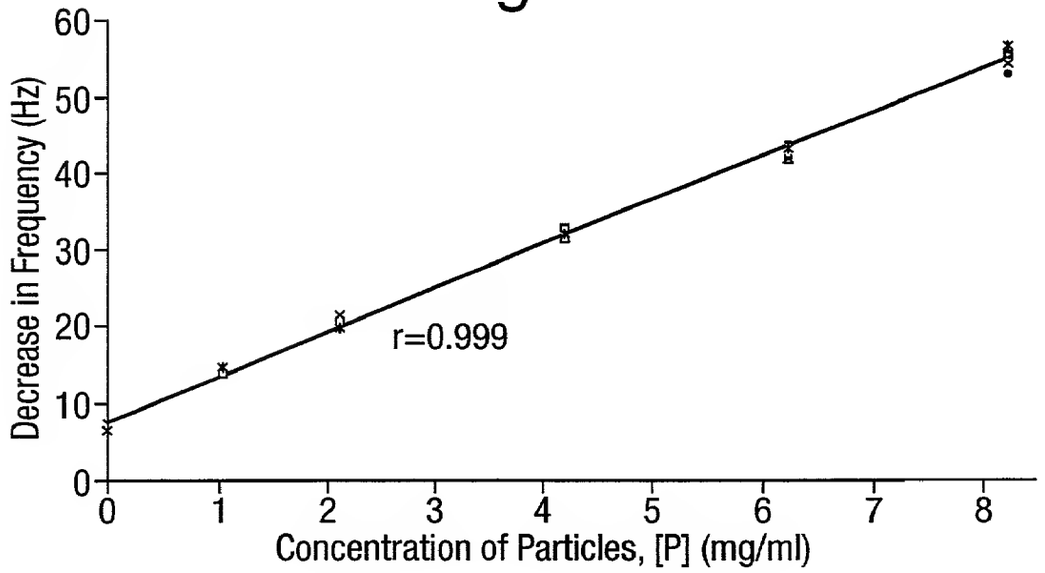

dc error signal
1
Frequency Meter
2
R
5
Voltage Controlled Oscillator
Phase Detector
3
C
L
4
6

Fig.4.


Decrease in Frequency (Hz)
60
50
40
30
20
10
0
r=0.999
0
1
2
3
4
5
6
7
8
Concentration of Particles, [P] (mg/ml)

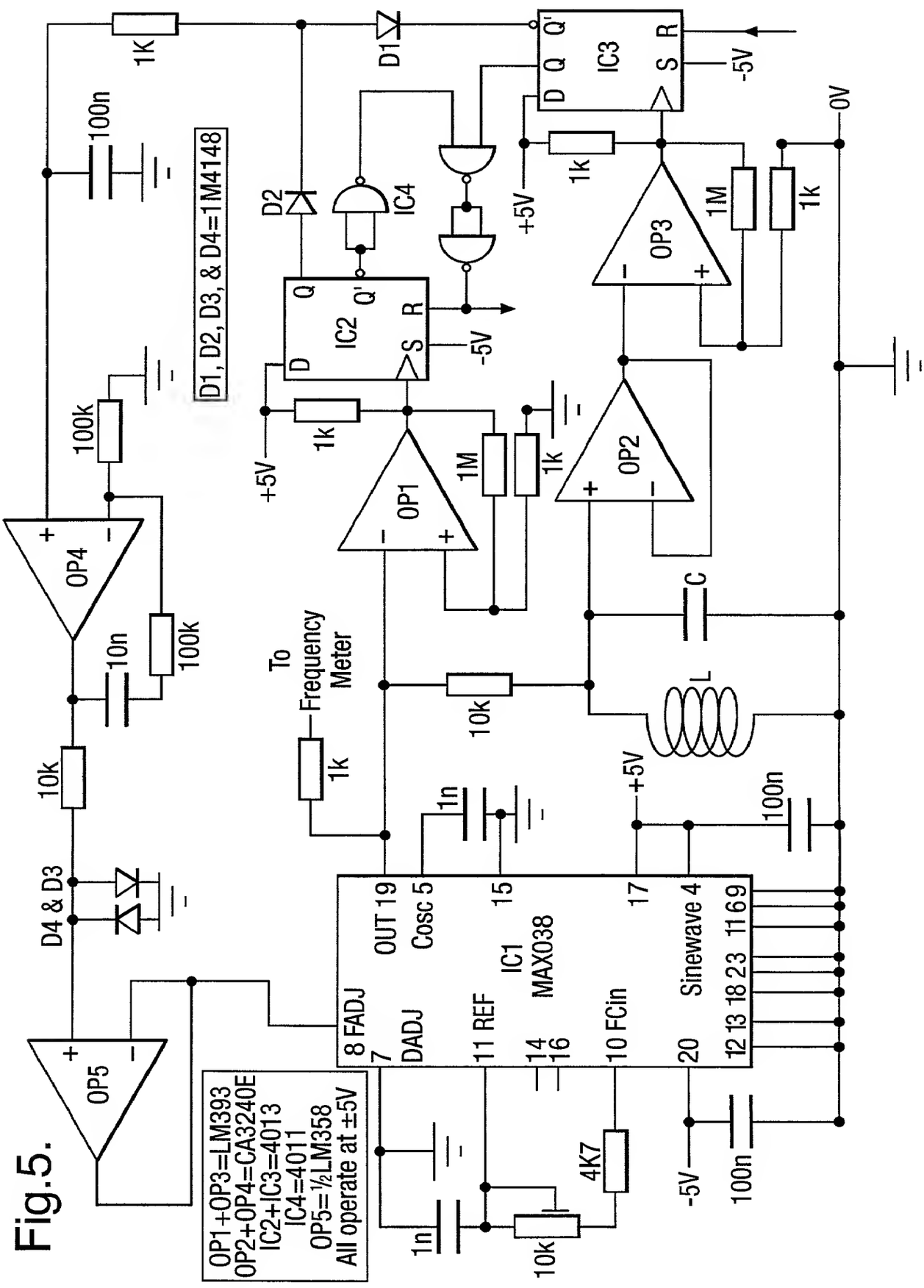

1K
100n
D1
D2
D1, D2, D3, & D4=1M4148
IC3
IC4
IC2
+5V
-5V
0V
1k
1M
OP3
OP1
OP2
OP4
OP5
100k
10n
10k
D4 & D3
To Frequency Meter
C
L
1n
100n
IC1
MAX038
8 FADJ
7 DADJ
OUT 19
Cosc 5
15
11 REF
14
16
17
10 FCin
20
Sinewave 4
11 6 9
12 13 18 23
4K7
OP1+OP3=LM393
OP2+OP4=CA3240E
IC2+IC3=4013
IC4=4011
OP5=½LM358
All operate at ±5V

Fig.5.

Fig.6.

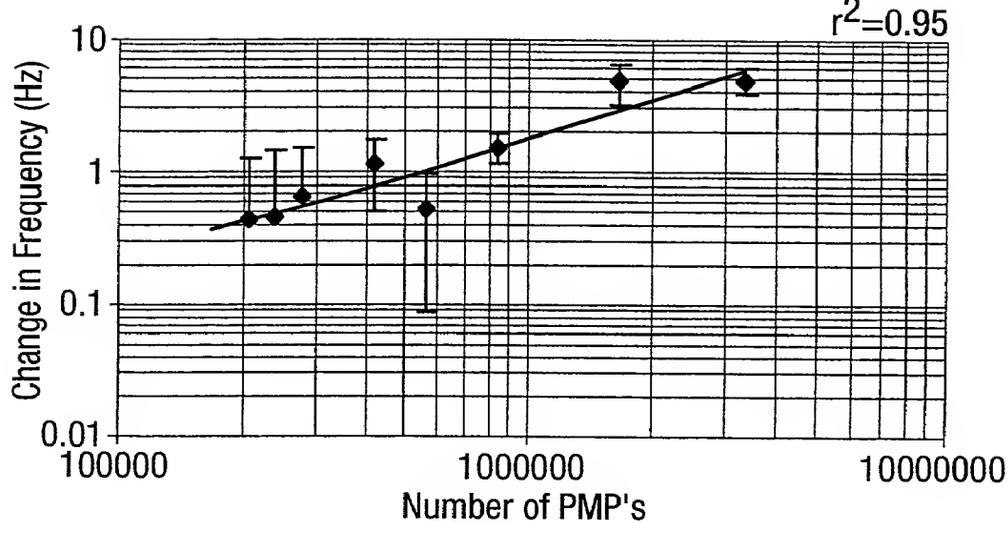

r^2=0.95
10
1
0.1
0.01
Change in Frequency (Hz)
100000
1000000
10000000
Number of PMP's

Fig.7.

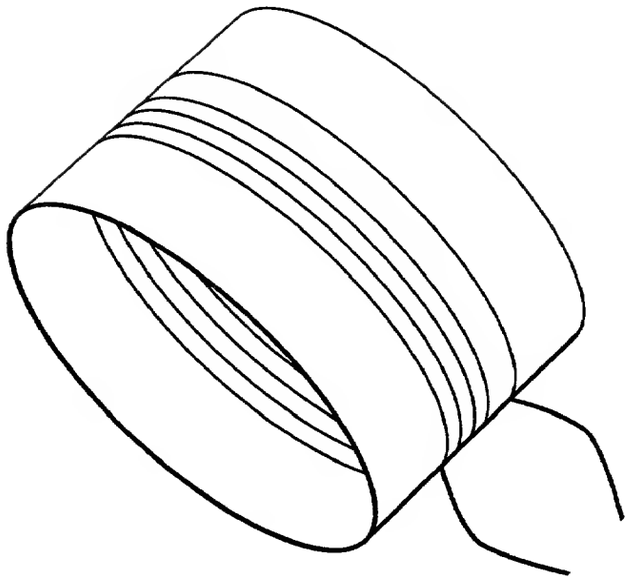


Fig.8.

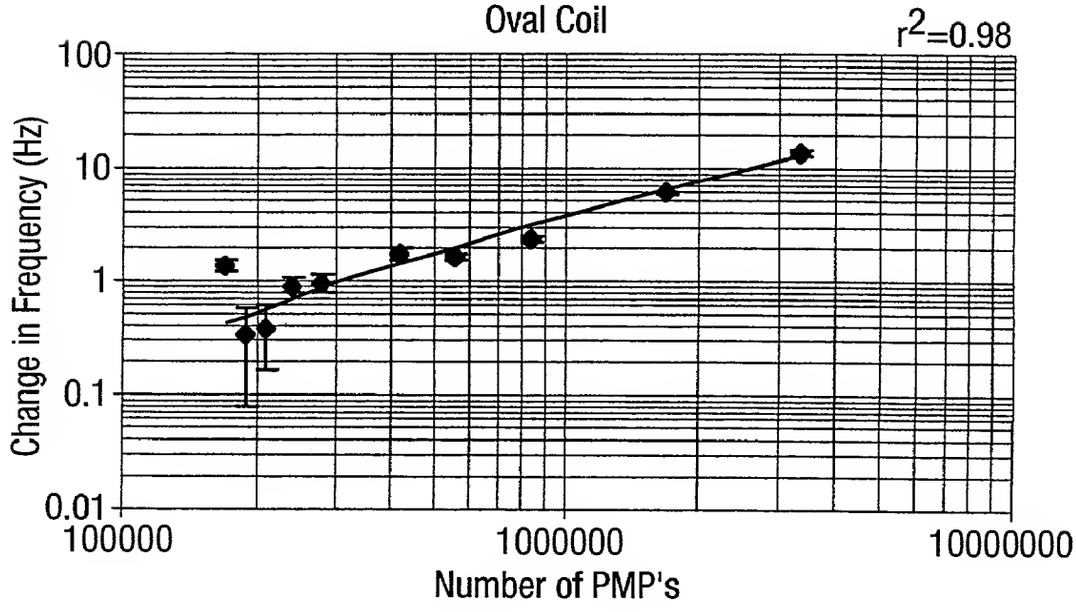

Oval Coil
r^2=0.98
100
10
1
0.1
0.01
Change in Frequency (Hz)
100000
1000000
10000000
Number of PMP's

Fig.9.

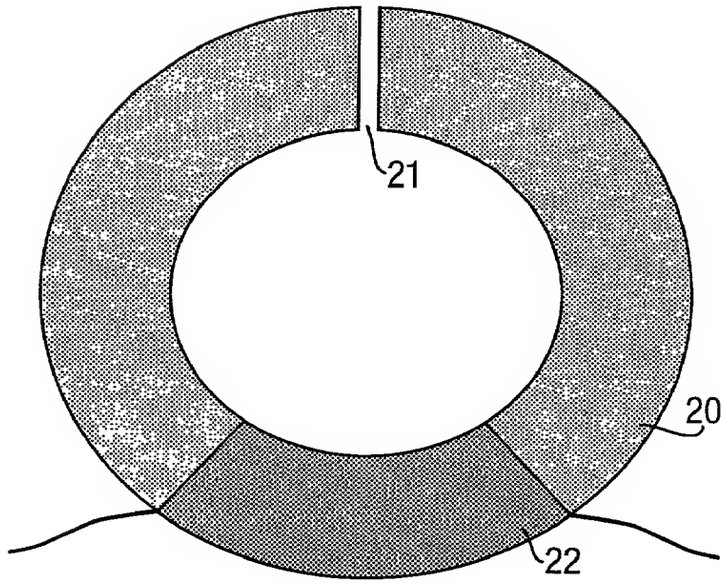

21
20
22

Fig.10.

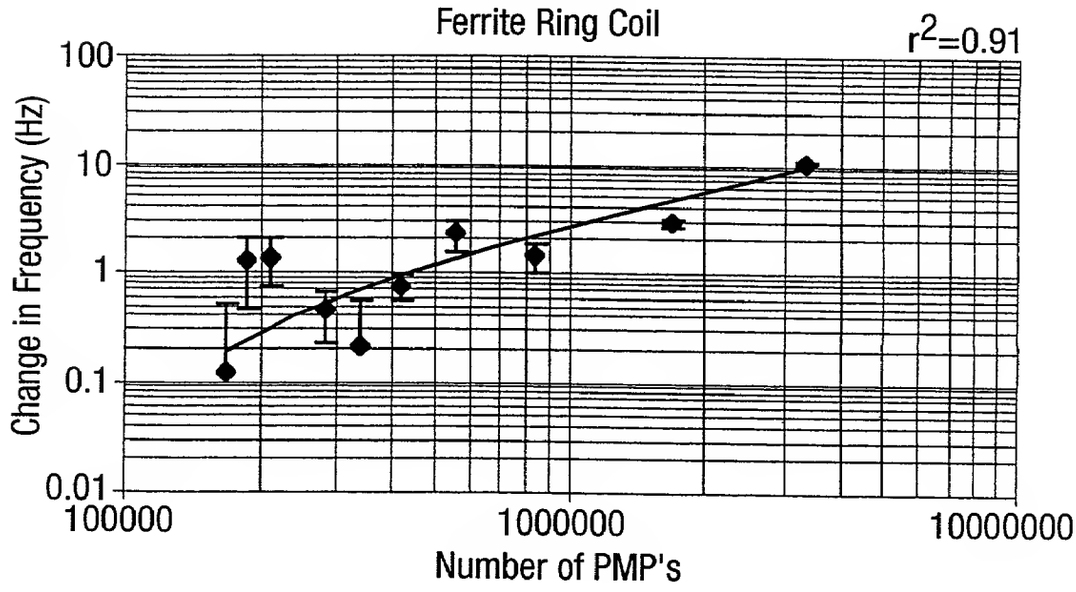

Ferrite Ring Coil
r^2=0.91
Change in Frequency (Hz)
100
10
1
0.1
0.01
100000
1000000
10000000
Number of PMP's

Fig.11(A).

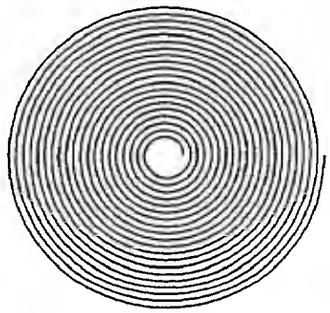


Fig.11(B).

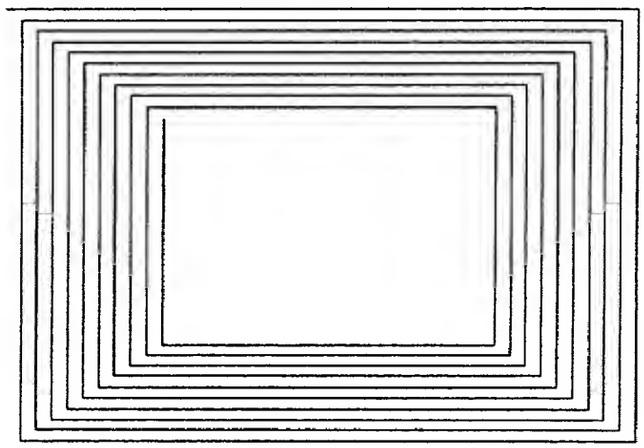


Fig.12.

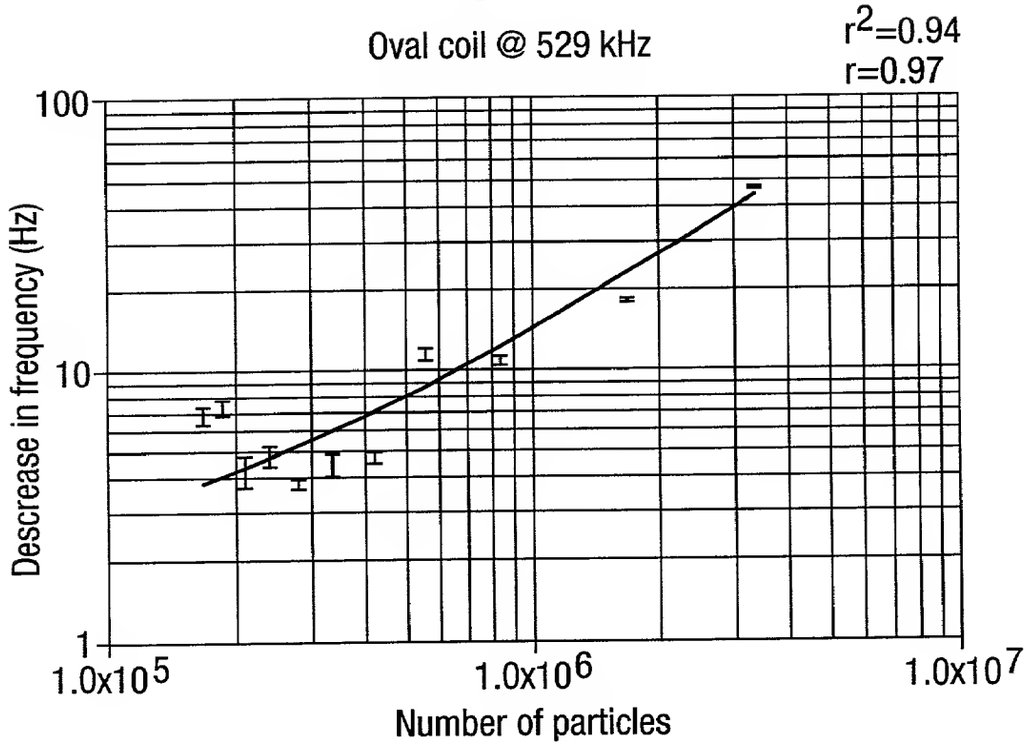
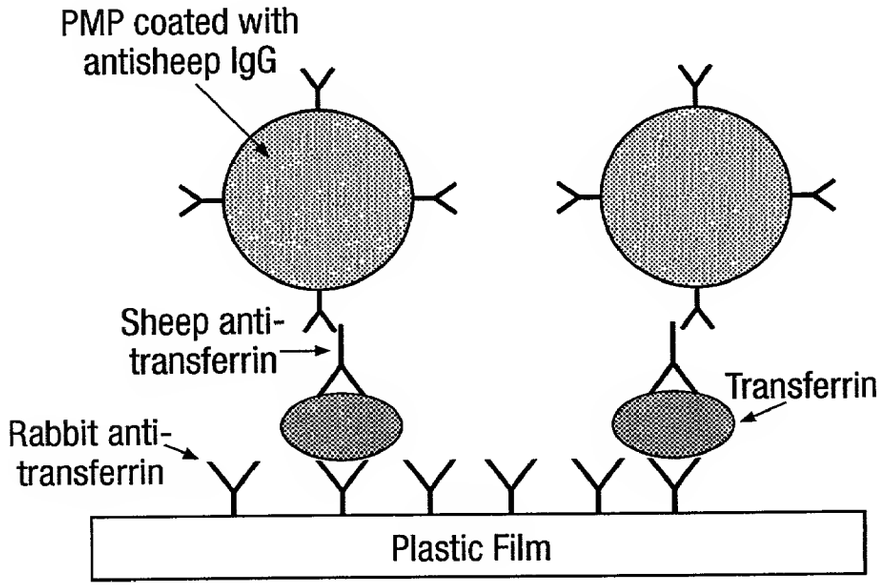

Oval coil @ 529 kHz
r^2=0.94
r=0.97
100
10
1
Descrease in frequency (Hz)
1.0x10^5
1.0x10^6
1.0x10^7
Number of particles

Fig.13.


PMP coated with antisheep IgG
Sheep anti-transferrin
Rabbit anti-transferrin
Transferrin
Plastic Film